SANDIA NATIONAL LABORATORIES
CHEMICAL & DISPOSAL ROOM PROCESSES DEPARTMENT 6748
WASTE ISOLATION PILOT PLANT PROJECT

TOP-541

CALIBRATION, USE, AND MAINTENANCE OF EPPENDORF MODEL 4810 AUTOCLAVABLE PIPETTES

Revision 0

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1.0 REVISION HISTORY

This document replaces TOP-6119-07 draft 1. The only purpose for this revision is to comply with SNLA-WIPP QA requirements.

2.0 PURPOSE

This procedure provides for the calibration, operation, maintenance of Eppendorf autoclavable pipettes as part of the laboratory geochemistry research activities in support of the Waste Isolation Pilot Plant (WIPP) Project.

3.0 SCOPE

This procedure is applicable only for the Eppendorf Model 4810 Autoclavable Pipettes.

This document is not meant to substitute for the manufacturer's reference manuals for autoclavable pipettes. The user is responsible for reading and understanding the manuals (see references).

4.0 SAFETY

This document does not address ES&H issues. Laboratory ES&H procedures described in the SOPs of the laboratory in which the equipment is used shall be adhered to.

5.0 RESPONSIBILITIES

The Principal Investigator (PI), or designee, whose activities warrant the use of this procedure is responsible for implementing the requirements of this procedure.

The Project Scientist (PS), or designee, is responsible for performing the calibrations and measurements following the requirements of this procedure, documenting calibrations, and assuring that the latest revision of this document is followed.

6.0 CONTROLS

Controls are established by written procedures or instructions prepared in accordance with QAP 5.3, PREPARING, REVIEWING, AND APPROVING TECHNICAL OPERATING PROCEDURES (Revison 1, effective date: 7/31/95) of the Sandia National Laboratories WIPP Quality Assurance Program. Procedures are issued in accordance with QAP 6.1, DOCUMENT CONTROL SYSTEM (Revision 1, effective date: 7/31/95) of the Sandia National Laboratories WIPP Quality Assurance Program.

7.0 QUALITY CONTROL

Quality Control shall be implemented through the use of performance tests. A performance test shall consist of the weighing (with a calibrated balance) a pipetted quantity of deionized water, which weighs 1 gram per mL at room temperature.

7.1 CALIBRATION

Calibration will be performed in accordance with section 9.2 of the Model 4810 Eppendorf Autoclavable Pipette Instruction Manual (see Appendix 1).

7.2 PERFORMANCE TEST CRITERIA

Performance tests will be done by weighing (with a calibrated balance) a pipetted quantity of deionized water, which weighs 1 gram per mL.

A difference of greater than 2% between the expected and measured weights of the pipetted water shall constitute a failed performance test.

7.3 CORRECTIVE ACTION

If a performance test is failed, the disposable tip shall be replaced, and the test repeated. If the test is again failed, the autopipette shall be recalibrated as per section 9.2 of the operator's manual (see Appendix 1).

Failures of performance tests and the remedial action taken shall be documented on the analysis printout. Failures of more than one performance test in a given day shall be documented in the appropriate scientific notebook.

7.4 FREQUENCY

The instrument's calibration shall be verified with performance tests immediately prior to each day's use.

8.0 PROCEDURE

The autopipettes shall be operated as per instructions in section 3 of the instruction manual (see Appendix 1).

Tips shall not be reused.

9.0 MAINTENANCE

No maintenance is required.

10.0 QA RECORDS

Performance test results will be recorded in the laboratory notebook in accordance with Sandia National Laboratories WIPP Quality Assurance Program Procedure 20-2, "PREPARING, REVIEWING, AND APPROVING SCIENTIFIC NOTEBOOKS" (Revision 1, effective date: 7/31/95).

11.0 REFERENCES

Brinkman Instruments, Incorporated, 1992. *Eppendorf Autoclavable Pipette Model 4810 Instruction Manual,* Brinkman Instruments, Incorporated, Westbury, NY.

QAP 5.3, PREPARING, REVIEWING, AND APPROVING TECHNICAL OPERATING PROCEDURES (Revison 1, effective date: 7/31/95)

QAP 6.1, DOCUMENT CONTROL SYSTEM (Revision 1, effective date: 7/31/95)

QAP 20.2, PREPARING, REVIEWING, AND APPROVING SCIENTIFIC NOTEBOOKS (Revision 1, effective date 7/31/95)

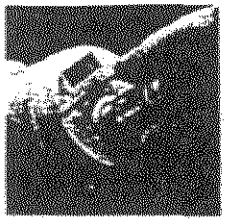


Fig. 2:
Volume setting

3 Operation

3.1 Volume setting

To adjust the volume setting, first unlock the mechanism by pulling the control button out to the stop (see Fig. 2).

Next turn the control button to select the volume.

Note:
When changing the volume to a higher setting, turn the display past the desired volume and then back to the volume to be used.

Lock the setting in place by pushing the button down.

The following table illustrates the digital indicator display on top of the pipette and provides the volume increments:

Model 4810	Display	Volume increment
0.5 – 10 µL	00.50 µL – 10.00 µL	0.1 µL
2 – 20 µL	02.00 µL – 20.00 µL	0.1 µL
10 – 100 µL	010.00 µL – 100.0 µL	0.1 µL
50 – 250 µL	0050 µL – 0250 µL	0.2 µL
100 – 1000 µL	0100 µL – 1000 µL	1.0 µL
500 – 2500 µL	0500 µL – 2500 µL	2.0 µL

When using 0.5 – 10 µL and 2 – 20 µL Model 4810 Pipettes, ensure that a zero ("0") appears in the second decimal place.

3.2 Pipetting

There are two recommended methods of pipetting.

Method 1: The sample is dispensed against the inside dry surface of the vessel.

Always pre-rinse the pipette tip with this procedure.

Method 2: The sample is dispensed against the surface of a liquid already present in the vessel.

The pipette tip should not be rinsed when using this method.

This method is recommended for the 0.5 to 10 µL capacity 4810 pipette.

Recommended handling is shown in Fig. 3.

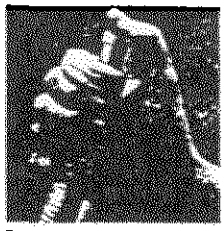


Fig. 3:
Handling

3.2.1 Pre-rinsing pipette tips*

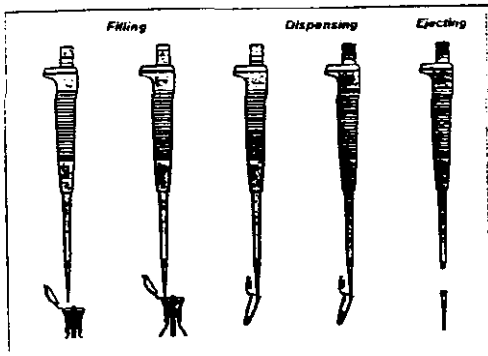
- Attach a pipette tip.
- Aspirate and dispense the sample liquid several times to pre-wet the tip.
- Use the blow-out stop with the final rinse.

*Do not pre-rinse tips when using the 0.5 to 10 µL pipette.

3.2.2 Filling (Fig. 4)

- If appropriate, pre-rinse tips (see previous Section 3.2.1).
- Press the control button down to the first stop (measuring stroke).
- Hold the pipette almost vertical.
- Immerse pipette tip 2 – 3 mm into the liquid.
- Allow the control button to glide back slowly, never let it snap back.
- Slide tip out along the inside of the vessel.
- Wipe off any external droplets on the tip with lint-free tissue.

Be sure not to wipe too closely to the pipette tip opening to avoid absorbing out any of the sample contents with the tissue.



3.2.3 Dispensing (Fig. 4)

Dispensing against a dry surface with rinsed tip:

- Hold tip against the inside wall of the vessel or directly against the surface of the liquid.
- Press the control button slowly down to the first stop (measuring stroke) and wait 1 – 3 sec.
- Then continue to press the control button down to the second stop (blow-out). This will deliver any remaining liquid in the pipette tip.

Fig. 4
Filling, Dispensing, Ejecting

- While continuing to hold the control button down, slide the tip out along the inside of the vessel.
- Eject the pipette tip by pressing the control button to the final stop (Fig. 4).

Dispensing the volume into a liquid:

- Immerse tip into the liquid.
- Slowly press the control button below to the first stop (which acts as a rinsing procedure) always letting the button glide back slowly.
- Actuate the blow-out and slide the tip out along the inside of the vessel.
- Eject the tip.

Note:
With the 0.5 to 10 µL pipette, the accuracy and precision values stated in Sec. 8 (Technical data) can only be reached when the volume is dispensed into a liquid.

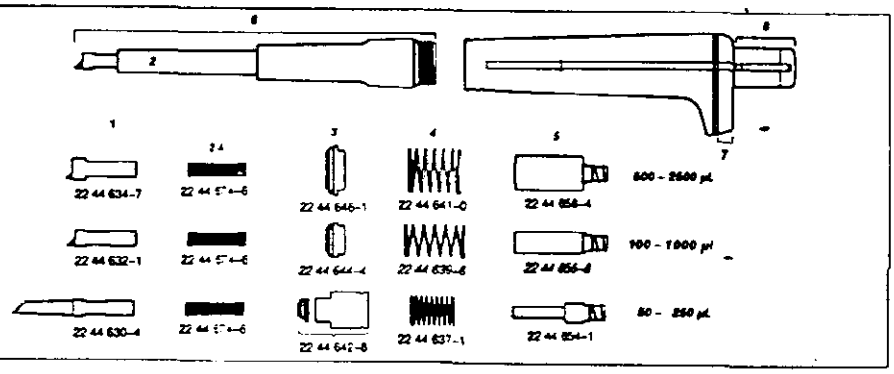
Important:
Never pipette liquid without attaching a tip to the pipette!

Never lay pipettes down with liquid in the tips!

9.2 Calibration

The 4810 Pipette has been calibrated with water at a temperature of 20°C by the manufacturer. Under normal operating conditions, this calibration cannot change. However, if the accuracy and precision of the instrument is questionable, refer to the following section for proper recalibration procedure.

Note: All other possibilities that can affect performance must first be evaluated such as maintenance, service and testing methods before readjusting the instrument. In addition, changing the factory calibration invalidates warranty status.



9.2.1 Adjustment procedure

- Perform the recommended gravimetric testing procedure as described in Section 4. The Pipette 4810, pipette tips and water used for testing must all be isothermal (20–25°C, constant to ± 0.5°C).
- Set the pipette to the nominal pipetting volume.
- Record 8 – 15 weighings using a four- or five-place micro balance. Adjust weights for changes in density due to temperature, barometric pressure and evaporation rate.
- Calculate the mean ($\bar{x}$) of those values. This will be the new volume reading.
- To adjust the calibration, insert the spanner wrench into the circular opening located on the side of the top of the pipette next to the digital display window. Push spanner into the aperture until it connects with the inner adjustment bushing.
- Turn the spanner to adjust the digital volume indicator to match the pipetted volume determined gravimetrically.
- Remove the spanner wrench.
- Re-set the pipette to the nominal volume.
- Re-check the dispensing volume by repeating the gravimetric method.

For further information regarding the calibration and maintenance of the Eppendorf 4810 Pipettes, contact Brinkmann Instruments.